UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/579,799	01/12/2007	Emil Edwin	EDWI3002REF	3481

23364 7590 10/26/2010

BACON & THOMAS, PLLC
625 SLATERS LANE
FOURTH FLOOR
ALEXANDRIA, VA 22314-1176

EXAMINER	
MCCRACKEN, DANIEL	

ART UNIT	PAPER NUMBER
1736	

MAIL DATE	DELIVERY MODE
10/26/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/579,799	EDWIN ET AL.	
	Examiner	Art Unit	
	DANIEL C. MCCRACKEN	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 August 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9,12-30 and 32-36* is/are pending in the application.

4a) Of the above claim(s) *12* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9,13-30 and 32-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Citation to the Specification will be in the following format: (S. # : ¶/L) where # denotes the page number and ¶/L denotes the paragraph number or line number. Citation to patent literature will be in the form (Inventor # : LL) where # is the column number and LL is the line number. Citation to the pre-grant publication literature will be in the following format (Inventor # : ¶) where # denotes the page number and ¶ denotes the paragraph number.

Status of Application

The response dated 8/2/2010 has been received and will be entered. Claims 1-9, 12-30, 32-36 are pending. Claim 12 is withdrawn from consideration. Claims 1 and 5 are currently amended. Claims 10-11 and 31 are acknowledged as cancelled.

Response to Arguments

Specification

I. With respect to use of the trademark "Raney," removing it from the claims obviates the indefiniteness issues. Applicants have not capitalized it as required by the office action. *See e.g.* (S. 4: 4) ("Raney metals"). In lieu of a non-compliant amendment, this should be corrected in the next response. Capitalize the trademarks.

II. With respect to the required sections of the specification, the amendment submitted will be entered. The objection is WITHDRAWN.

Claim Rejections – 35 U.S.C. §112

I. With respect to the rejection of Claims 3, 5 and 31 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention, the amendment to Claim 5 obviates the rejection of that claim. As to Claim 3, the remarks state "Claim 3 actually says that the energy is used to power an electricity generator, i.e. the heat produced by burning the hydrogen could be used to produce electricity." (Remarks of 8/2/2010 at 9). On reconsideration, this is persuasive. The rejection of Claim 3 is WITHDRAWN. As to Claim 31, this rejection is mooted by cancellation and accordingly WITHDRAWN.

Claim Rejections – 35 U.S.C. §103

I. With respect to the rejection of Claims 1-4, 6-7, 13-17, 19, 28-33 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 4,435,376 to Porter, et al. in view of: Mitsugi, et al., *WE-NET: Japanese Hydrogen Program*, Int. J. Hydrogen Energy 1998; 23(3): 159-165 (hereinafter "Mitsugi at __"), Jin, et al., *A novel gas turbine cycle with hydrogen-fueled chemical-looping combustion*, Intl. J. Hydrogen Energy 2000; 25: 1209-1215 (hereinafter "Jin at __"), US 5,775,091 to Bannister, et al., and further in view of US 5,618,875 to Baker, et al., the traversal is on the grounds that the references do not teach the features of Claim 1, *as amended*. (Remarks of 8/2/2010 at 9). This is persuasive. The rejection is WITHDRAWN, but updated to address the amendment. In the Non-final Office Action, official notice was taken with respect to power generation from hydrogen. *See* (Non-final Office Action at 6). Applicants have not traversed the assertion of official notice. As such, the common knowledge/well-known in the art

statement is taken to be admitted prior art. *See* MPEP 2144.03 C ("If applicant does not traverse the examiner's assertion of official notice or applicant's traverse is not adequate, the examiner should clearly indicate in the next Office action that the common knowledge or well-known in the art statement is taken to be admitted prior art because applicant either failed to traverse the examiner's assertion of official notice or that the traverse was inadequate.").

A declaration was filed - albeit for a different application – and has been considered. The declaration is directed to different rejections and references in a separate application, and as such, the relevance of the declaration is not understood and/or the remarks made therein are not probative to the rejections of the instant application. Insofar as the Examiner understands (as it was not developed), Applicants "appear" to argue the criticality of the newly claimed pressure. (Remarks of 8/2/2010 at 10). Applicants state:

> The plot *below* (which was present in the inventor's declaration filed in 10/514,238, shows the effect of pressure on carbon deposits expressed as hourly grams of carbon per gram of catalyst as a function of time and increase of yield from 7 grams of carbon per gram of catalyst to 86 grams of carbon per gram of catalyst was found when pressure was increased from 1 bar (blue ptot, almost vertical line) to 5 bar (pink plot, sloping).

(Remarks of 8/2/2010 at 10) (emphasis added). No plot was presented in the remarks, but it is assumed Applicants are referring to Figure 8 on page 10 of the declaration. This figure is acknowledged. It is noted that at least early in the reaction, the lower pressure is more efficient/active. Furthermore, it is not clear from the evidence submitted that both experiments were carried out for the same time. Thus, the fact that the higher pressure produced more carbon isn't necessarily persuasive, as this experiment was carried out for nearly 2.5 days whereas the

low pressure experiment was carried out for 6 hours. It comes as no surprise that the integral of a "longer" curve gives a bigger number.

The remarks further state:

> *In fact, the generally accepted opinion in the field has been to use low pressures because this favours the reaction ($CH_4 \rightarrow C + 2H_2$) thermodynamically.* The highly efficient catalytic reaction which has been found at higher pressures by the Applicant allows the method of the invention to be applied on a large scale, e.g. to produce large quantities of carbon and hydrogen directly from hydrocarbon reservoirs.

(Remarks of 8/2/2010 at 10) (emphasis added). No evidence was presented to support the position that low pressure was thermodynamically favored and that this was "the generally accepted opinion in the field." This is unsubstantiated attorney argument and the Examiner requests clarification on this point.

II. With respect to the rejection of Claim 8 under 35 U.S.C. 103(a) as being unpatentable over US 4,435,376 to Porter, et al., Mitsugi, Jin, US 5,775,091 to Bannister, et al., and US 5,618,875 to Baker, et al. as applied to claim 1 above, and further in view of US 2004/0040304 to Wolff, et al., the remarks appear to rely on the amendment to Claim 1. (Remarks of 8/2/2010 at 11). This is persuasive. The rejection is WITHDRAWN.

III. With respect to the rejection of Claim 9 under 35 U.S.C. 103(a) as being unpatentable over US 4,435,376 to Porter, et al., Mitsugi, Jin, US 5,775,091 to Bannister, et al., and US 5,618,875 to Baker, et al. as applied to claim 1 above, and further in view of US 4,941,893 to Hsieh, et al., the remarks appear to rely on the amendment to Claim 1. (Remarks of 8/2/2010 at 11). This is persuasive. The rejection is WITHDRAWN.

IV. With respect to the rejection of Claim 18 under 35 U.S.C. 103(a) as being unpatentable over US 4,435,376 to Porter, et al., Mitsugi, Jin, US 5,775,091 to Bannister, et al., and US 5,618,875 to Baker, et al. as applied to claim 1 above, and further in view of Mango, *The light hydrocarbons in petroleum: a critical review*, Org. Geochem. 1997; 26(7/8): 417-440, this rejection does not appear to have been traversed. As such, no response is believed necessary. In the Non-final Office Action, official notice was taken with respect to hydrocarbons coming from hydrocarbon wells. *See* (Non-final Office Action at 9). Applicants have not traversed the assertion of official notice. As such, the common knowledge/well-known in the art statement is taken to be admitted prior art. *See* MPEP 2144.03 C ("If applicant does not traverse the examiner's assertion of official notice or applicant's traverse is not adequate, the examiner should clearly indicate in the next Office action that the common knowledge or well-known in the art statement is taken to be admitted prior art because applicant either failed to traverse the examiner's assertion of official notice or that the traverse was inadequate.").

V. With respect to the rejection of Claims 5, 7, 20-27 and 36 under 35 U.S.C. 103(a) as being unpatentable over US 4,435,376 to Porter, et al., Mitsugi, Jin, US 5,775,091 to Bannister, et al., and US 5,618,875 to Baker, et al. as applied to claim 1 above, and further in view of US 6,395,403 to Schmidt and Gao, et al., *Synthesis of carbon nanotubes by catalytic decomposition of methane using $LaNi_5$ hydrogen storage alloy as a catalyst*, Chemical Physics Letters 2000; 327: 271-276 (hereinafter "Gao at __"), the remarks appear to rely on the amendment to Claim 1. (Remarks of 8/2/2010 at 11). This is persuasive. The rejection is WITHDRAWN.

VI. With respect to the rejection of Claim 34 under 35 U.S.C. 103(a) as being unpatentable over US 4,435,376 to Porter, et al., Mitsugi, Jin, US 5,775,091 to Bannister, et al.,

and US 5,618,875 to Baker, et al. as applied to claim 1 above, and further in view of US 5,046,247 to Oguro, et al., the remarks appear to rely on the amendment to Claim 1. (Remarks of 8/2/2010 at 11). This is persuasive. The rejection is WITHDRAWN.

Note new rejections below.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

I. Claims 1-5, 9, 13, 18, 20-21, 28, 32-33 and 36 are rejected under 35 U.S.C. 102(a/e) as being anticipated by US 2003/0144565 (US 7,019,184) to Allison, et al.

Note that the Allison reference is available under both 102(a) and 102(e) depending on whether the PGPUB or patent is relied on. Reference shall be made to the PGPUB.

With respect to Claim 1, this claim requires "contacting said gaseous hydrocarbon at a pressure of from 3 to 6 bar and an elevated temperature in a reactor with a catalyst capable of converting said hydrocarbon to carbon and hydrogen." Allison teaches contacting natural gas with a catalyst at the claimed pressures and elevated temperatures. *See e.g.* (Allison 3: [0032] – natural gas; [0044] – general process; 4: [0046] pressure and temperature). Claim 1 further requires "separating hydrogen produced from unconverted hydrocarbon; burning said hydrogen

to generate energy." Hydrogen is separated. *See e.g.* (Allison 2: [0031]; "Fig. 3") (hydrogen stream 20). Combustion is recited. *Id.* Claim 1 further requires "using the energy generated to heat said reactor or the gaseous hydrocarbon flow thereto, or to heat or power a heat or power consuming apparatus." Power is generated. *See e.g.* (Allison "Fig. 3"). The use for the power (which is generically claimed as a "power consuming apparatus") is taught. (Allison 2: [0031]) ("power consuming unit"). Note that the "conversion into carbon of gaseous hydrocarbons" language appears in the preamble. This has been considered but does not "breath life" into the claim and is not considered limiting. However, to the extent that somehow this is to be construed as limiting, note that this language reads on catalyst fouling and that the gasses, temperatures and pressures are all taught. Ergo it is expected that "carbon" is necessarily formed. As to Claim 2, supply to the conversion unit is taught. (Allison 2: [0031]). As to Claim 3, electricity/power generation is taught. *Id.* As to Claim 4, particulate catalyst is taught. (Allison 4: [0058]). As to Claim 5, a transition metal is taught. (Allison 4: [0055]). Recitation of a zeolite suggests the porosity claimed. (Allison 4: [0049]). As to Claim 9, a membrane is taught. (Allison 5: [0061]). As to Claim 13, the combustion chamber taught at (Allison 2: [0031]) requires air to combust, and ergo is a "air heating apparatus." As to Claim 18, removal from the well is taught. (Allison "Fig. 2"). As to Claim 20, transition metals are taught. (Allison 4: [0055]). As to Claim 21, particles are taught. (Allison 4: [0058]). As to Claim 28, methane is taught. (Allison 3: [0044]). As to Claims 32-33, depending how these are interpreted, the method can be performed continuously or batch wise. (Allison 2: [0029]).

With respect to Claim 36, this claim appears to reflect a slightly different embodiment than that presented in Claim 1. The discussion of Claim 1 is relied upon. Note that taking gas

from the wellhead is taught (Allison "Fig. 2") and heating of the reactor is taught. (Allison 2: [0031]).

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

I. Claims 6 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 2003/0144565 (US 7,019,184) to Allison, et al. in view of US 4,766,265 to Desmond, et al.

The discussion of Claim 1 accompanying the anticipation rejection ("I") *supra* is expressly incorporated herein by reference. As to Claim 6, to the extent Allison may not teach the metals claimed, this does not impart patentability. Nickel catalysts for conversion of methane to aromatics (*i.e.* the process being described in Allison) are old and known and the examiner takes official notice that they are. In support of taking official notice, the Examiner provides Desmond. *See* (Desmond 2: 39 *et seq.* - process; 2: 27 - nickel). Use of a known catalyst composition consistent with its known uses does not impart patentability. *See* MPEP 2143. As to Claim 19, optimizing metal content is an obvious expedient, as it would appear to affect selectivity. *See* (Desmond 4: 50 *et seq.*) (Examples).

II. Claims 14-17, 22-27, 29-30 and 32-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 2003/0144565 (US 7,019,184) to Allison, et al.

The discussion of Claim 1 and 21 accompanying the anticipation rejection ("I") *supra* is expressly incorporated herein by reference. As to Claims 14-17, Allison reasonably suggests the

purity of the hydrogen streams claimed by virtue of reciting the separation at (Allison 5: [0061]). Achieving the desired purity is an obvious expedient via adding stages/membranes, in accordance with the teachings of Allison. As to Claims 22-24, surface area is related to diameter or particle size. Note that Allison teaches that the catalyst can be pelletized (Allison 4: [0058]) and that multiple reactor embodiments are contemplated (Allison 4: [0047]). Selection of the appropriate size is an obvious expedient to, for example, fluidize a catalyst bed as suggested by Allison. (Allison 4: [0047]). As to Claims 25-27, the same rationale expressed in connection with Claims 22-24 applies. As to Claims 29-30, note that Allison teaches that the gas can come from the wellhead (Allison "Fig. 2") and that impurities can be present. Claiming the particular concentration of the feedstock is an obvious expedient, owing to the particular characteristics of the gas well. As to Claims 32-33, to the extent Allison can only be characterized as teaching a continuous process, a batch process is an obvious expedient to facilitate testing, etc. at the lab or bench top scale.

III. Claims 7-8 rejected under 35 U.S.C. 103(a) as being unpatentable over US 2003/0144565 (US 7,019,184) to Allison, et al. in view of US 2004/0040304 to Wolff, et al.

The discussion of Claim 1 accompanying the anticipation rejection ("I") *supra* is expressly incorporated herein by reference. As to Claim 7, to the extent Allison doesn't claim the particle size, note that Allison states that the catalyst/zeolite can be pellitized (suggesting control of size) (Allison 4: [0058]) and that a host of reactors are contemplated (Allison 4: [0047]. Selection of the catalyst size is an obvious expedient to fluidize a bed as suggested by Allison. (Allison 4: [0047]). As to Claim 8, note that Allison teaches combustion. (Allison 2: [0032]). To the extent Allison doesn't state *in haec verba* "internal combustion engine," Wolff does. *See e.g.*

(Wolff 2: [0023] *et seq.*). One would be motivated to employ an internal combustion engine for similar reasons, including but not limited to creating electricity (Wolff 2: [0026]) and advantages appurtenant thereto.

.

IV. Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 2003/0144565 (US 7,019,184) to Allison, et al. in view of US 5,046,247 to Oguro, et al.

The preceding discussion of Claim 1 is expressly incorporated herein by reference. Note that Allison states hydrogen can be removed by conventional techniques. (Allison 5: [0061]). To the extent metallic hydrides are not taught, Oguro teaches use of metal hydrides for hydrogen adsopriton. *See* (Oguro 1: 12 *et seq.*). Use of a known material (metal hydrides) consistent with its known uses in a manner suggested by the prior art (Allison) would be obvious to one of skill in the art.

V. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 2003/0144565 (US 7,019,184) to Allison, et al. in view of US 4,435,376 to Porter.

The preceding discussion of Claim 1 is expressly incorporated herein by reference. Note that Allison states hydrogen can be removed by conventional techniques. (Allison 5: [0061]). As to Claim 35, to the extent Allison may not teach pressure swing adsorption, this is a known technique and the Examiner takes official notice that it is. In support of taking official notice (*i.e.* in making sure there is "substantial evidence" on the record) the Examiner provides Porter. Pressure swing adsorption is taught. (Porter 2: 47).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL C. MCCRACKEN whose telephone number is (571)272-6537. The examiner can normally be reached on Monday through Friday, 9 AM - 6 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley S. Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Daniel C. McCracken/
Daniel C. McCracken
Examiner, Art Unit 1736
DCM

/Stuart L. Hendrickson/
Primary Examiner, Art Unit 1736